

Natural Sound Analogue of String Theory in Guitar Systems Author: EDUARDO COLIN SANCHEZ

Abstract: I present a formalized hypothesis for a natural, audible phenomenon observed in stringed instruments, particularly guitars, which exhibits patterns reminiscent of string-theory-like behavior. This phenomenon, referred to as the Sound Natural Law, can be described as a system of string and fret interactions governed by periodic and non-local patterns. The system demonstrates emergent tonal coherence, mirror symmetry, and operator-induced "teleportation" of tonal states, suggesting a rich underlying geometric structure that maps to perceptual equivalence classes.

Introduction:

Empirical observation suggests that guitars exhibit a latent self-organizing tonal behavior when interacted with according to specific geometric rules. These rules involve:

- * Doors: adjacent fret steps inducing global tonal shifts
- * Mirrors: period-4 symmetry along the fret dimension
- * Teleports: cross-string and cross-fret actions generating perceptual color shifts

This hypothesis proposes a structured framework that physicists can analyze, potentially linking acoustic patterns to abstract string-theoretic analogues.

System Definition:

The guitar can be viewed as a two-dimensional grid of strings and frets. Each point on the grid corresponds to a pitch and a tonal identity, which we call the tonal color. This color changes depending on interactions with other strings and frets.

Operators:

- * Doors: Moving one or more frets forward or backward can change the overall tonal color across the guitar.
- * Mirrors: Every four frets along the same string create a repeating tonal pattern, preserving coherence.
- * Teleports: Moving from one string to another while changing frets can produce a global tonal shift, introducing new colors across the guitar.

Grid Decomposition:

The fretboard can be divided into three zones: low, mid, and high. Each zone has

its own tonal color, and movements between zones can transfer tonal color, creating coherent sound across the instrument.

Discussion:

This framework allows for modeling the guitar as a system with discrete tonal dynamics, periodic symmetries, and non-local interactions. It can be tested experimentally by observing tonal responses to specific sequences of fret and string movements. The structure can also inspire computational or graph-based simulations.

Conclusion:

The Sound Natural Law describes a guitar-based phenomenon exhibiting:

- * Mirror symmetry every four frets
- * Tonal teleportation through cross-string movements
- * Self-organizing tonal coherence across the fretboard

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